

15379 and 15380
Shocked Olivine Basalt
64.3 and 5.2 grams



Figure 1: Photo of dust-covered walnut sample 15379 (basalt?). Sample is about 4 cm across.
NASA S87-44333.

Introduction

Lunar samples 15379 and 15380 were collected as part of a rake sample from the rim of Spur Crater (part way up the Apennine Front). They have similar mode, texture and shock features and may be companion pieces.

Petrography

Papanastassiou and Wasserburg (1973) give a brief description. Ryder (1985) states that: "15379 is a fine-grained mare basalt containing about 20% stubby-

angular and partly "hollow" plagioclase, abundant brownish pyroxene, and at least some olivine and ilmenite". Plagioclase is milky, but not maskelynite. Both plagioclase and pyroxene have deformed twinning. Veins of dark glass, containing bubbles, crosscut the sample and show evidence of flow (figure 2).

Ryder (1985) finds that sample 15380 is very similar to 15379. It also has shock features and glass veins (figure 3).

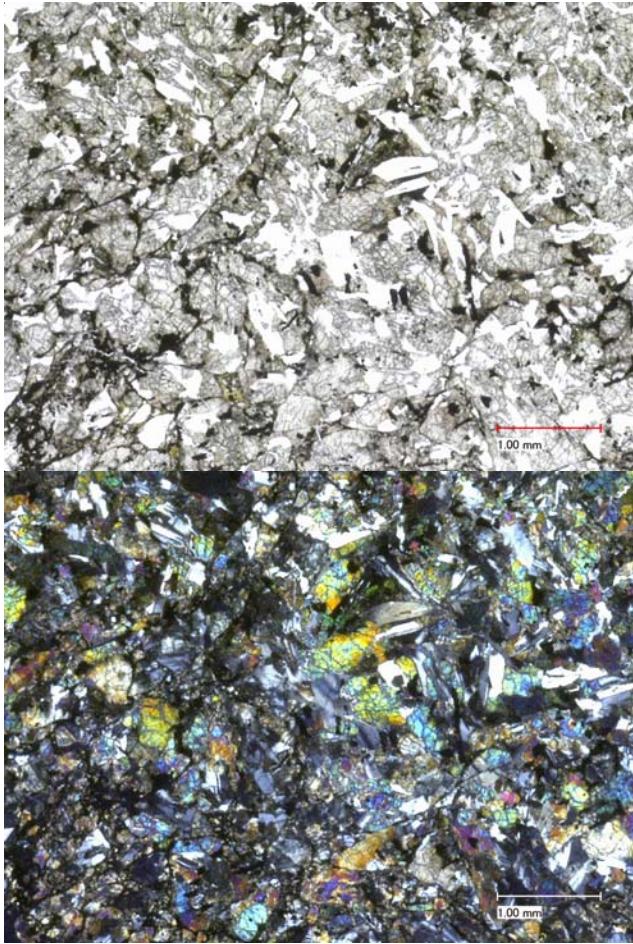


Figure 2: Photomicrographs of 15380,3 by C Meyer @50x (bottom with crossed-polarizers).



Figure 3: Photomicrographs of 15379,1 by C Meyer @50x (bottom with crossed-polarizers).

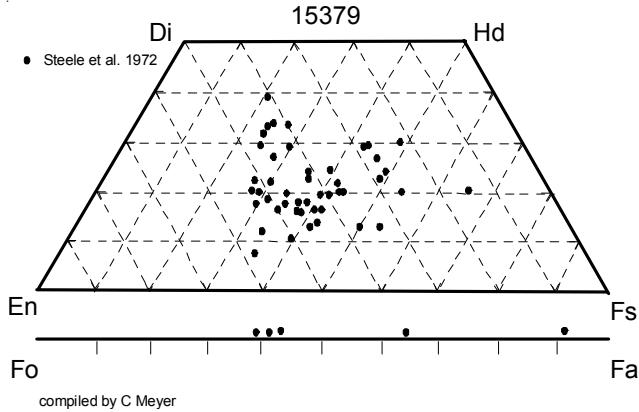


Figure 4: Chemical composition of olivine and pyroxene in 15379 (from Steele et al. 1972).

Mineralogy

Pyroxene: Steele et al. (1972) determined the pyroxene composition (figure 4).

Chemistry

The chemical composition of 15379 and 15380 is consistent with that of the olivine-normative clan of Apollo 15 basalts (figures 5 – 7).

Radiogenic age dating

Nyquist et al. (1973) and Papanastassiou and Wasserburg (1973) determined the isotopic composition of Sr and concluded that 15379 was a typical Apollo 15 basalt.

Cosmogenic isotopes and exposure ages

Eldridge et al. (1972) reported the cosmic-ray-induced activity of ^{22}Na = 31 dpm/kg, ^{26}Al = 42 dpm/kg and ^{54}Mn = 32 dpm/kg (which make it “undersaturated” and hence recently brought to the surface).

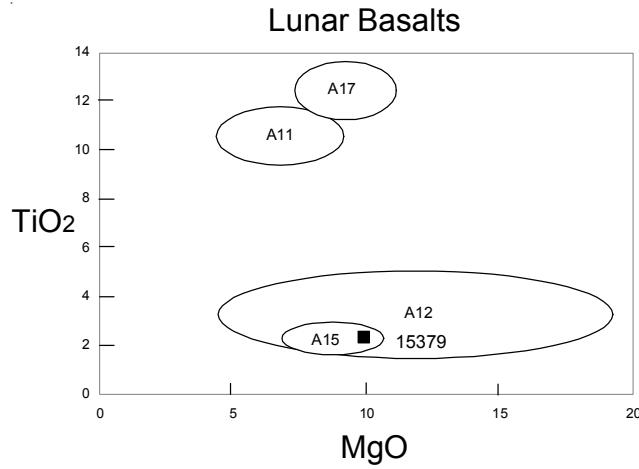


Figure 5: Chemical composition of 15379 compared with that of other lunar basalts.

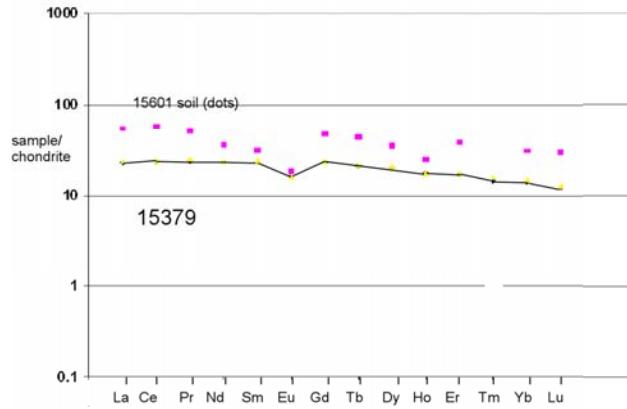


Figure 6: Normalized rare-earth-element diagram for 15379. 15601 soil is plotted for comparison.

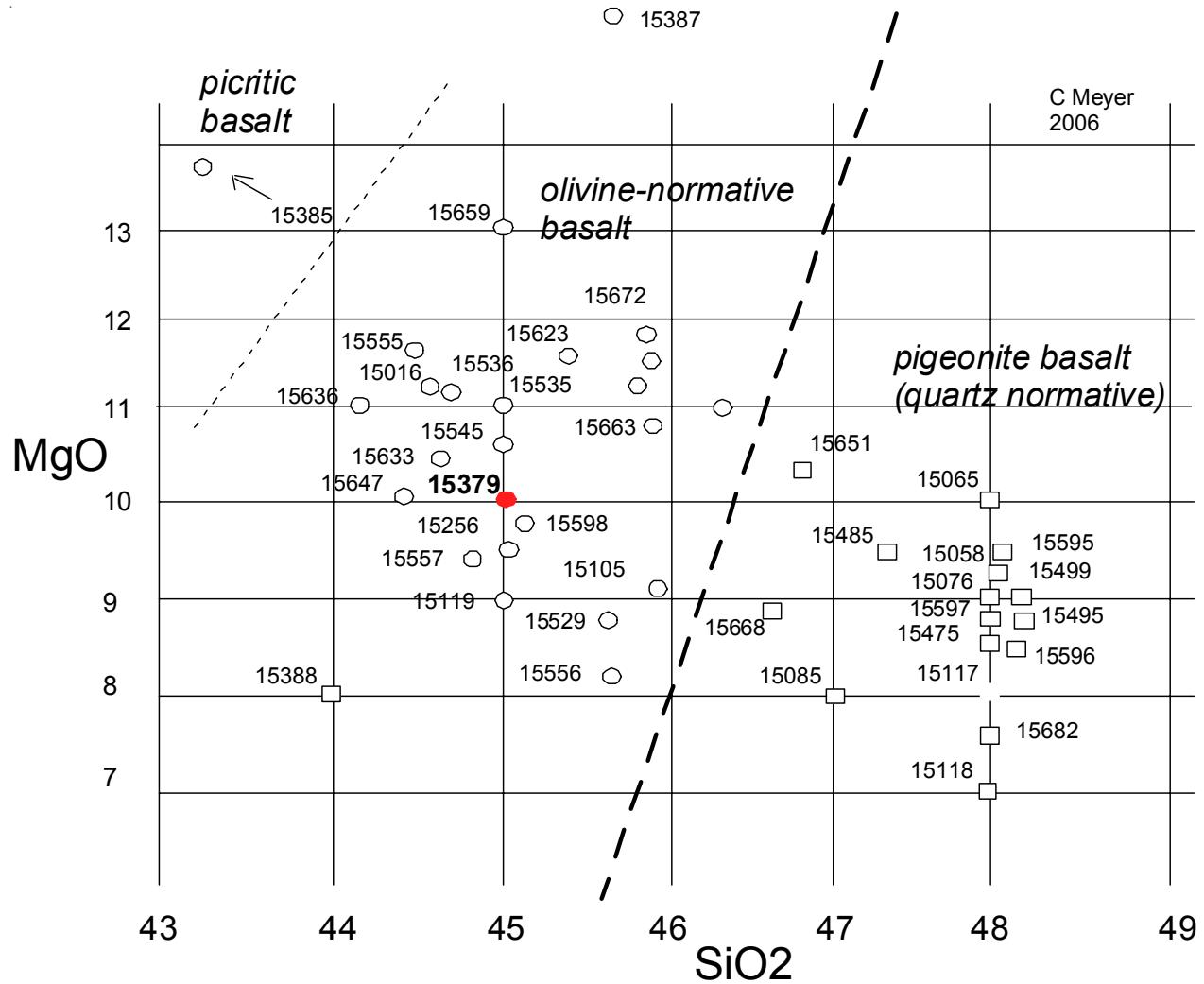


Figure 7: Chemical composition of Apollo 15 basalts, with 15379 squarely within the field of olivine-normative basalts.

Table 1. Chemical composition of 15379.

reference	Laul 73	Ryder2001	Church72	Weismann75	O'Kelley72	Cuttitta73	Christian72	Neal2001	15380	Helmke73
weight		5 g		34 mg						
SiO ₂ %		44.9	(e)			44.6	(b)	46.1	(f)	
TiO ₂	2.3	(a) 2.42	(e)	2.25	(c)	2.51	(b)	2.55	(f)	
Al ₂ O ₃	9.3	(a) 8.76	(e)			8.27	(b)	8.33	(f)	
FeO	22.6	(a) 22.34	(e)	22.3	(a)	22.92	(b)	22.8	(f)	
MnO	0.27	(a) 0.283	(e)			0.29	(b)	0.258	(f)	
MgO	10	(a) 10.07	(e)	8.62	(c)	10.75	(b)	10.2	(f)	
CaO	9.1	(a) 9.72	(e)			9.55	(b)	9.85	(f)	
Na ₂ O	0.28	(a) 0.22	(e)	0.258	(a) 0.26	(c)	0.27	(b)	0.258	(f)
K ₂ O	0.05	(a) 0.045	(e)	0.05	(c) 0.048	(d) 0.06	(b)	0.057	(f)	
P ₂ O ₅		0.065	(e)			0.12	(b)			
S %										
sum										
Sc ppm	42	(a)		42.5	(a)					
V	220	(a)				38	(f)	41	(g) 44	(a)
Cr	4060	(a) 4898	(e)	4860	(a)	4380	(b)	4319	(g) 4600	(a)
Co	49	(a)		54.6	(a)	67	(f)	54	(g) 49	(a)
Ni	66	(e)	84	(a)		120	(f)	68	(g)	
Cu	8	(e)						14	(g)	
Zn								17	(g) 3	(a)
Ga						4.7	(f)	3.85	(g) 3.5	(a)
Ge ppb										
As										
Se										
Rb	3	(e)		0.84	(c)			0.97	(g) 0.9	(a)
Sr	92	(e) 60	(a)	98.5	(c)	130	(f)	100	(g)	
Y	22	(e)				28	(f)	28.5	(g)	
Zr	84	(e)		86.3	(c)	74	(f)	96	(g)	
Nb	10	(e)				12	(f)	6.5	(g)	
Mo								0.06	(g)	
Ru										
Rh										
Pd ppb										
Ag ppb										
Cd ppb										
In ppb										
Sn ppb										
Sb ppb								10	(g)	
Te ppb										
Cs ppm										
Ba	60	(a)	43	(a) 51.5	(c)	70	(f)	0.04	(g) 0.043	(a)
La	4.9	(a)	4.92	(a) 5.64	(c)			55	(g)	
Ce	14	(a)	14.7	(a) 14.6	(c)			5.4	(g) 4.21	(a)
Pr								14.2	(g) 11.2	(a)
Nd			9	(a) 10.3	(c)			2.14	(g)	
Sm	3.6	(a)	3.51	(a) 3.18	(c)			10.5	(g) 9.1	(a)
Eu	0.93	(a)	0.89	(a) 0.98	(c)			3.4	(g) 3.14	(a)
Gd				3.67	(c)			0.89	(g) 0.81	(a)
Tb	0.7	(a)	0.76	(a)				4.55	(g) 4.1	(a)
Dy	4.7	(a)		4.42	(c)			0.77	(g) 0.69	(a)
Ho								4.96	(g) 4.65	(a)
Er				2.92	(c)			0.98	(g) 0.93	(a)
Tm								2.7	(g) 2.6	(a)
Yb	2.3	(a)	2.17	(a) 2.11	(c)			0.35	(g)	
Lu	0.33	(a)	0.29	(a) 0.304	(c)			2.3	(g) 2.05	(a)
Hf	3.1	(a)	2.56	(a) 2.2	(c)			0.29	(g) 0.279	(a)
Ta	0.4	(a)	0.37	(a)				2.54	(g) 2.1	(a)
W ppb								0.38	(g)	
Re ppb										
Os ppb										
Ir ppb										
Pt ppb										
Au ppb										
Th ppm			0.43	(a)		0.49	(d)	0.53	(g)	
U ppm				0.133	(c)	0.15	(d)	0.14	(g)	

technique: (a) INAA, (b) wet chem, (c) IDMS, (d) radiation counting, (e) XRF, (f) other, (g) ICP-MS

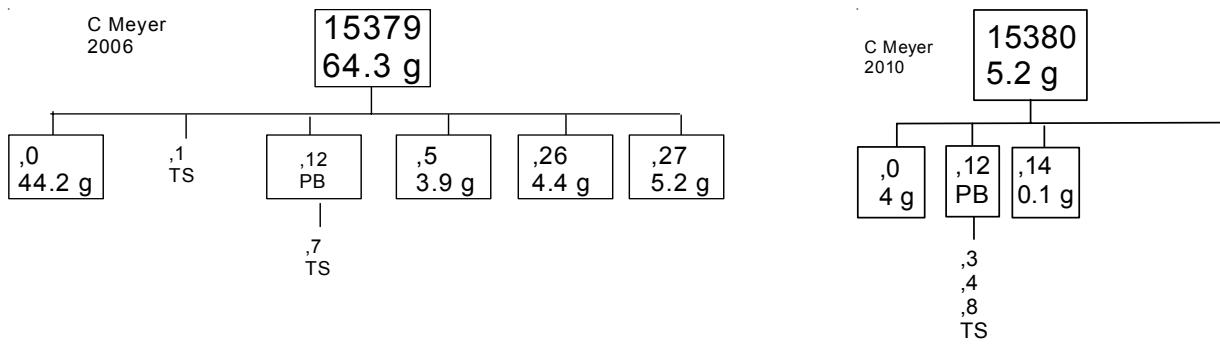


Figure 7: Processing photo of 15380 after breaking.
Scale in mm. S87-34935.

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